Swinburne University of Technology

Faculty of Science, Engineering and Technology

ASSIGNMENT COVER SHEET

Subject Code: COS30008

Subject Title: Data Structures and Patterns

Assignment number and title: 2, Indexers, Iterators, and Inheritance

Due date: April 20, 2021, 16:00

Lecturer: Dr. Markus Lumpe

Your name: Khang Trinh **Your student id:** 102118468

Check Tutorial	Wed 08:30	Wed 10:30	Wed 16:30	Thurs 08:30	Thurs 10:30	Thurs 14:30	Thurs 16:30	Fri 08:30	Fri 10:30	Fri 14:30
					X					

Marker's comments:

Problem	Marks	Obtained
1a	54	
1b	64	
2	44	
Total	162	

Extension certification:

This assignment has been given an extension and is now due on ____________________

Signature of Convener:____________________________

Problem 1

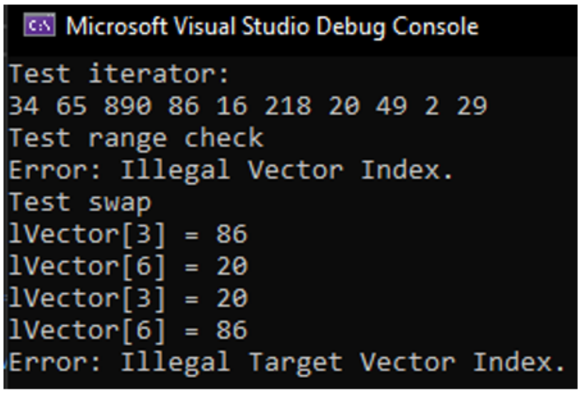
IntVector.cpp

```
#include "IntVector.h"
#include <iostream>

using namespace std;

IntVector::IntVector(const int aArrayOfIntegers[], size_t aNumberOfElements)
{
	fNumberOfElements = aNumberOfElements;
	fElements = new int[fNumberOfElements];

	for (size_t i = 0; i < fNumberOfElements; i++) {
		fElements[i] = aArrayOfIntegers[i];
	}
}

IntVector::~IntVector()
{
	delete fElements;
}

size_t IntVector::size() const {
	return fNumberOfElements;
}

void IntVector::swap(size_t aSourceIndex, size_t aTargetIndex) {
	if (aSourceIndex == aTargetIndex) {
		throw out_of_range("Can't swap the same index.");
	}

	if (aSourceIndex >= fNumberOfElements) {
		throw out_of_range("Illegal Source Vector Index.");
	}

	if (aTargetIndex >= fNumberOfElements) {
		throw out_of_range("Illegal Target Vector Index.");
	}

	int lBuffer = fElements[aSourceIndex];
	fElements[aSourceIndex] = fElements[aTargetIndex];
	fElements[aTargetIndex] = lBuffer;
}

void IntVector::sort(const IntSorter& aSorter) {
	aSorter(*this);
}

const int IntVector::operator[](size_t aIndex) const {
	if (aIndex < 0 || aIndex >= fNumberOfElements) {
		throw out_of_range("Illegal Vector Index.");
	}

	return fElements[aIndex];
}

IntVectorIterator IntVector::begin() const {
	return IntVectorIterator (*this);
}

IntVectorIterator IntVector::end() const {
	return IntVectorIterator(*this, size());
}
```

IntVectorIterator.cpp

```
#include "IntVector.h"
#include "IntVectorIterator.h"

IntVectorIterator::IntVectorIterator(const IntVector& aContainer, size_t aStart) :
fContainer(aContainer), fPosition(aStart) {

}

const int IntVectorIterator::operator*() const {
	return fContainer[fPosition];
}

IntVectorIterator& IntVectorIterator::operator++() {
	fPosition++;
	return *this;
}

IntVectorIterator IntVectorIterator::operator++(int) {
	IntVectorIterator old = *this;
	++(*this);
	return old;
}

bool IntVectorIterator::operator==(const IntVectorIterator& aRHS) const {
	return
		&fContainer == &aRHS.fContainer &&
		fPosition == aRHS.fPosition;
}

bool IntVectorIterator::operator!=(const IntVectorIterator& aRHS) const {
	return !(*this == aRHS);
}

IntVectorIterator IntVectorIterator::begin() const {
	IntVectorIterator iter = *this;

	iter.fPosition = 0;
	return iter;
}

IntVectorIterator IntVectorIterator::end() const {
	IntVectorIterator iter = *this;

	iter.fPosition = iter.fContainer.size();
	return iter;
}
```

Output

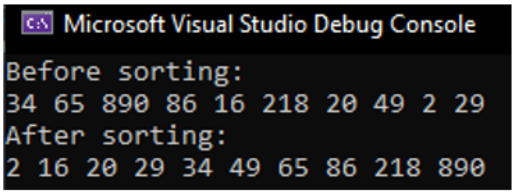


```
Test iterator:
34 65 890 86 16 218 20 49 2 29
Test range check
Error: Illegal Vector Index.
Test swap
lVector[3] = 86
lVector[6] = 20
lVector[3] = 20
lVector[6] = 86
Error: Illegal Target Vector Index.
```

CocktailShakerSort.cpp

```
#include "IntVector.h"
#include "CocktailShakerSort.h"

void CocktailShakerSort::operator()(IntVector& aContainer) const {

	int beginIndex = 0;
	int endIndex = aContainer.size() - 1;

	while (beginIndex < endIndex) {
		for (int i = beginIndex; i <= endIndex - 1; i++)
		{
			if (aContainer[i] > aContainer[i + 1]) {
				aContainer.swap(i, i + 1);
			}
		}

		endIndex--;

		for (int i = endIndex; i >= beginIndex + 1; i--)
		{
			if (aContainer[i] < aContainer[i - 1]) {
				aContainer.swap(i, i - 1);
			}
		}

		beginIndex++;
	}
}
```

Output



```
Before sorting:
34 65 890 86 16 218 20 49 2 29
After sorting:
2 16 20 29 34 49 65 86 218 890
```